

DISCUSSION OF THE AMENDMENT

Due to the length of the specification herein, Applicants will cite to the paragraph number of the published patent application (PG Pub) of the present application, i.e., US 2005/0148753, when discussing the application description, both in this section and in the Remarks section, *infra*, rather than to page and line of the specification as filed.

The specification has been amended by inserting back both the heading --Example 8-- and the degree symbol, i.e., --°--, which was inadvertently dropped in the previous amendment.

Claim 1 has been amended by limiting component B) to compounds having only three active hydrogen atoms per molecule, as supported in the specification at paragraph [0065], by replacing the term “contains” with the synonymous --comprises--, where appropriate, and by inserting -- a molar ratio of compounds having only two active hydrogens atoms per molecule to compounds having only three active hydrogens atoms per molecule, is at least $15\frac{2}{3}:1$ --. The latter amendment is supported by the data in the Table at paragraph [0238]. The ratio of $15\frac{2}{3}:1$ (4.7:0.3) was calculated, from Example 6, by dividing the sum of the molar amounts in columns 2, 3, 4, 8, 9 and 10, i.e., compounds having only two active hydrogens atoms per molecule (4.7) with the molar amount in column 6, i.e., compounds having only three active hydrogens atoms per molecule (0.3). Higher value ratios can be calculated for other examples according to the invention, such as 16:1 (Example 7), $23\frac{1}{2}:1$ (Example 13) and $23\frac{1}{2}:1$ (Example 8).

No matter is believed to have been added by the above amendment. Claims 1-20 remain pending in the application.

REMARKS

Applicants thank the Examiner and the Examiner's supervisor for the courtesy extended to Applicants' attorney during the interview held May 13, 2008, in the above-identified application. During the interview, Applicants' attorney explained the then-claimed invention and why it is patentable over the applied prior art. The discussion is summarized and expanded upon below.

The rejections under 35 U.S.C. § 103(a) of:

Claims 1-20 as unpatentable over US 4,992,507 (Coogan et al);

Claims 1-3, 5 and 7-10 as unpatentable over Coogan et al in view of US 6,524,564 (Kim et al);¹ and

Claims 1-20 as unpatentable over Coogan et al in view of US 6,566,438 (Ingrisch et al),

are respectfully traversed.

Coogan et al discloses a free acid group- or free tertiary amino group- containing water-dispersible polyurethane (column 1, lines 8-12), wherein the free acid group containing polyurethane is the reaction product of: (A) a nonionic-water-dispersible, isocyanate-terminated polyurethane prepolymer formed by reacting: (i) an organic polyisocyanate; (ii) at least one organic polyol having a molecular weight in the range of 62 to 6000; (iii) a dispersing diol and/or diisocyanate having a pendant polyoxyethylene chain; and (iv) an isocyanate-reactive compound containing at least one carboxylic acid group and at least two groups which are more reactive than carboxylic acid groups toward isocyanate groups; and (B) an active hydrogen containing chain extender (column 2, lines 37-51).

Thus, Coogan et al forms an isocyanate-terminated polyurethane prepolymer, and then reacts the prepolymer with a chain extender.

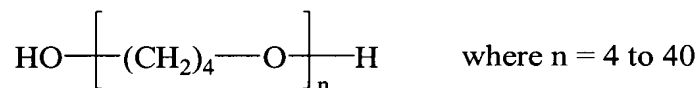
¹ The Office Action incorrectly states that these claims are anticipated under 35 U.S.C. § 102(b). However, the text of the rejection makes clear that 35 U.S.C. § 103(a) was intended.

The Examiner has particularly relied on Example 20 therein which, since neither the polyol (PTMEG (T-1000)) nor the chain extender (hydrazine) contains a free tertiary amino group (column 2, lines 52-64), is an example of the free acid group-containing water-dispersible polyurethane embodiment of Coogan et al.

Presumably, the polyurethane of Example 20 is not crosslinked, in view of the subsequent disclosure of post crosslinking (column 14, lines 30-45).

The present-claimed invention, on the other hand, is drawn to a crosslinked polyurethane obtained by reacting components of a composition comprising

- A) 15 to 50% by weight of at least one polytetrahydrofuran of the formula



- B) 0.1 to 5% by weight of at least one compound which has only 3 active hydrogen atoms per molecule
- C) 8 to 20% by weight of at least one compound which comprises at least 2 active hydrogen atoms per molecule and at least one ionogenic and/or ionic group per molecule, where the groups may be anionogenic, anionic, cationogenic or cationic
- D) 25 to 60% by weight of at least one diisocyanate, wherein up to 3 mol% of said at least one diisocyanate can be replaced by triisocyanates
- E) 0 to 15% by weight of at least one compound different from B) and C) which comprises at least 2 active hydrogen atoms and has a molecular weight of from 60 to 5000, wherein said compound is selected from the group consisting of diols, amino alcohols, polyamines, polyesterdiols, polyetherols, and polysiloxanes

or a salt thereof,

with the proviso that the reactive components add up to 100%, wherein a molar ratio of compounds having only two active hydrogens atoms per molecule to compounds having only three active hydrogens atoms per molecule, is at least $15\frac{2}{3}:1$.

In the production of cross-linked polyurethanes, obtained by reacting active hydrogen bearing compounds such as hydroxy-containing compounds, with diisocyanates and other hydrogen donating compounds, the higher the presence of compounds having three or more active hydrogen groups, the greater the cross-linking. On the other hand, the degree of cross-linking is much less when using such compounds having only two active hydrogen groups. However, if too high an amount of compounds having at least three active hydrogen groups are used, extensive cross-linking will occur, yielding copolymers which lack the necessary flexibility required for, for example, hair styling polymers. Accordingly, the presently-claimed invention now requires a minimum ratio of compounds having two active hydrogen atoms per molecules to compounds having three active hydrogen atoms per molecule.

In Coogan et al, as Applicants' attorney pointed out during the above-referenced interview, at least isocyanate groups must be available after the polyurethane prepolymer is formed so that the prepolymer can be chain extended with the active hydrogen containing chain extender. Presumably, the result is still not a crosslinked polyurethane, in view of the above-discussed disclosure of post crosslinking. In the presently-claimed invention, on the other hand, the crosslinked polyurethane is obtained by reacting components **in a composition**, rather than a two-step reaction, followed by post crosslinking. In the present invention, the reaction is one-step and no provision is made to shield isocyanate groups so they can participate in a subsequent reaction, and crosslinking is also effected.

It is respectfully submitted that any organic chemist would appreciate that the presently-claimed crosslinked polyurethane is different from, and not suggested by, the post-crosslinked polyurethane of Example 20, or any other disclosure in Coogan et al, even when

the above-discussed ratio added to the claims is ignored. Nevertheless, Coogan et al neither discloses nor suggests any significance in operating within such a ratio.

Kim et al discloses, *inter alia*, (1) free-radically polymerizable, siloxane-containing urethane (meth)acrylates which comprise, in incorporated form, a) at least one compound which contains at least one active hydrogen atom and at least one free-radically polymerizable α,β -ethylenically unsaturated double bond per molecule, b) at least one diisocyanate, c) at least one compound which contains two active hydrogen atoms per molecule, d) at least one compound which contains at least one active hydrogen atom and at least one siloxane group per molecule; and (2) water-soluble or water-dispersible polymers which comprise these urethane (meth)acrylates in copolymerized form (Abstract). The urethane (meth)acrylates of Kim et al are not crosslinked polyurethanes *per se*. The above-mentioned polymers within the scope of Kim et al are water-soluble or water-dispersible polymers obtained by copolymerizing at least one of the inventive urethane (meth)acrylates and at least one free-radically polymerizable α,β -ethylenically unsaturated monomer M (column 14, line 46ff).

The Examiner holds that it would have been obvious “to combine the teachings of” Coogan et al in view of Kim et al. The Examiner finds that Coogan et al teaches the presently-claimed polyurethane “with the specific reactants such as hexamethylene and isophorone diisocyanate, while [Kim et al] teaches making a polyurethane prepolymer with substantially the same reactants and further the specific diisocyanate reactants which can be replaced by up to 3 mol% triisocyanate. As such one of ordinary skill in the art would know that triisocyanates can be substituted for diisocyanates up to 3 mol% in polyurethane formation.”

It is not clear why one skilled in the art would combine Coogan et al and Kim et al, but if combined, the result would still not be the presently-claimed invention. Neither the

polyurethane prepolymer nor the final polyurethane of Coogan et al is a free radical polymerized material. Indeed, Kim et al's component a) requires at least one free-radically polymerizable α,β -ethylenically unsaturated double bond per molecule (column 4, lines 13-16). No corresponding component appears in Coogan et al or in the present claims. Nor does Kim et al disclose any compound having only three hydroxy groups.

Ingrisch et al is drawn to a hybrid urethane polymer dispersion having a particular composition (column 1, line 60 through column 3, line 45). Ingrisch et al discloses their component (A)(iii) is present preferably in an amount of 0.5 to 3% by weight, and that an example of said component is dimethylolpropionic acid (column 5, lines 1-20), and that their neutralizing component (D) is preferably present in an amount of 0.15 to 1.5% by weight, which component may be N-methyl-diethanolamine (column 6, lines 25-32).

The Examiner finds that Coogan et al does not disclose a compound analogous to presently-recited component C) in the presently-recited amounts, and then holds that it would have been obvious, in effect, to vary the relative amounts of the components in Coogan et al based on the percentage ranges disclosed for the components in Ingrisch et al.

In reply, Applicants have previously argued that even if a substitution were made with regard to presently-recited component C), the result would be 4.5% by weight, or less than the presently-recited minimum of 8% by weight. The Examiner responds that the amount in Ingrisch et al would be 5.5% by weight, which is still significantly lower than the 8% minimum herein. Nevertheless, Ingrisch et al does not remedy the above-discussed fundamental deficiencies in Coogan et al with regard to the two-step reaction to form their presumably non-crosslinked polyurethane, followed by post crosslinking. In other words, the difference between the presently-claimed invention and Coogan et al is not simply the relative amounts of the reactive components used to form the final product.

With regard to crosslinking herein, the Examiner finds that the present claims are not drawn to a specific percentage of crosslinking or crosslinking agent, but rather that the preamble “teaches ‘crosslinked polyurethane’ which is what the art teaches.”

In reply, to the extent the Examiner finds that the term “crosslinked polyurethane” can be ignored because it is in the preamble, it is clear that the term “crosslinked polyurethane” is a claim limitation herein.

For all the above reasons, it is respectfully requested that the rejections be withdrawn.

Applicants **again** respectfully traverse the Examiner’s lining-out of documents AP and AU on the Form PTO-1449 originally submitted with the Information Disclosure Statement (IDS) filed December 22, 2004, and lining-out document AU on the Form PTO-1449 originally submitted with the IDS filed September 22, 2004.

As the Examiner quotes from M.P.E.P. § 609.04, “[i]f the concise explanation is part of the specification, the IDS listing **should** include the page(s) or line(s) numbers where the concise explanation is located in the specification” (emphasis added).

Thus, since the Examiner apparently accepts the fact that the statement of relevancy included with both the above IDSs indicated that the lined-out documents are discussed in the specification, the Examiner was not proscribed from consideration of this prior art simply because page(s) and line(s) of the specification were not specified. Nevertheless, DE 3929973 (document AP in the IDS filed December 22, 2004) is described in the specification at page 22, lines 1-3; Fikentscher (document AU in the IDS filed December 22, 2004) is described in the specification at page 20, lines 17-21. WO 01/16200 (document AU in the IDS filed September 22, 2004) is described in the specification at page 4, line 9 through page 5, line 2. Accordingly, **submitted herewith** are copies of the above-discussed original Form PTO-1449s. The Examiner is respectfully requested to initial each in the appropriate boxes, and include a copy of the initialed Forms with the next Office communication.

Application No. 10/508,764
Reply to Final Office Action of February 15, 2008

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Customer Number

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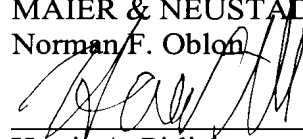
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